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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Guo-Quan Lu

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EXAMINER

TAKEUCHI, YOSHITOSHI

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1793

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/589,399	Applicant(s) LU ET AL.	
	Examiner YOSHITOSHI TAKEUCHI	Art Unit 1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 April 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 and 14-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 and 14-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 August 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Claims 1-12 and 14-20 are presented for examination, wherein claims 1, 7 and 14 are currently amended. Claim 13 is cancelled.
2. The prior 35 U.S.C. § 103(a) rejections of claims 1-12 and 14-20 are withdrawn as a result of the applicants' amendments to said claims and arguments.

Continued Examination Under 37 CFR 1.114

3. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on April 20, 2010 has been entered.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. The factual inquiries set forth in Graham v. John Deere Co., 383 U.S. 1 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

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4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).
7. Claims 1-12 and 14-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kydd (US 5,882,722).

- a. Regarding claims **1-6**, Kydd teaches a colloidal silver suspension for forming electrical interconnect (abstract) with particles with a diameter of about 10 to 40 nm (abstract, which is entirely within the instantly claimed range of 100 nm or less); dispersants, such as stearic acid, associated with the metal powder to prevent agglomeration of the metal powders (8:64-66, where stearic acid is a fatty acid) in sufficient quantity to reduce agglomeration of said particles (expected, since the dispersant is added to disperse particles).

Kydd does not teach the instant invention using binder, but does teach related art using binders, such as ethyl cellulose, in the composition (5:34, where ethyl cellulose is a polymeric material and has a volatilization temperature below the metal powder's sintering temperature). However, Kydd teaches US Patent Number 4,186,244 (hereinafter the '244 patent) is similar, wherein the silver particles are blended with a vehicle

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consisting of an ethyl cellulose binder and a pine oil solvent. As a result, it would have been obvious to use the vehicle of the '244 patent with the dispersant and silver particles of Kydd, since both references teach similar compounds and the vehicle of the '244 patent would make handling the silver particles of Kydd more manageable.

b. Regarding claims **7**, **10** and **12**, Kydd teaches a method for forming an interconnect which performs at least one of mechanically, thermally or electrically connecting a device to a substrate (abstract, teaching both bonding and thermal/electrical conduction) comprising the step of: sintering conductive metal or metal alloy particles (6:66) that have a size of 10-40 nm (abstract, entirely within the instantly claimed range of 100 nm or less), which are positioned on contacts on the device and the substrate and sandwiched therebetween (abstract), said sintering step forming a conductive metal or metal alloy layer from said metal or metal alloy particles which performs one or more of mechanically, thermally, or electrically interconnecting the device and the substrate (abstract, teaching both bonding and thermal/electrical conduction), wherein the conductive metal is silver, (5:4) said metal or metal alloy, prior to said step of sintering, may be present in the form of a paste (9:27) which comprises a dispersant associated with the metal or metal alloy particles (8:64-66) in sufficient quantity to reduce agglomeration of said particles (expected, since the dispersant is added to disperse particles).

Kydd does not teach the instant invention using binder or being a paste prior to sintering, but does teach related art using binders, such as ethyl cellulose, in the composition (5:34, where ethyl cellulose has a volatilization temperature below the metal powder's sintering temperature). However, Kydd teaches US Patent Number 4,186,244

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(hereinafter the '244 patent) is similar, wherein the silver particles are blended with a vehicle consisting of an ethyl cellulose binder and a pine oil solvent. As a result, it would have been obvious to use the vehicle of the '244 patent with the dispersant and silver particles of Kydd, since both references teach similar compounds and the vehicle of the '244 patent would make handling the silver particles of Kydd more manageable.

c. Regarding claims **8-9**, Kydd teaches the method of claim 7, further comprising a step of depositing via silk screening, stenciling or printing on at least one electrical contact of at least one of the device and the substrate said metal or metal alloy particles. (9:42-49).

d. Regarding claim **11**, Kydd teaches the method of claim 7, wherein a step of holding the device and the substrate together during the step of sintering would be expected since the device and substrate are being sintered together.

e. Regarding claim **14-16**, Kydd teaches a method for connecting a substrate and a device (abstract), comprising positioning a paste (9:27) between contacts of said substrate and said device (9:43, wherein the composition is applied) which comprises (i) a conductive metal or metal alloy powder (6:66) composed of particles that have a size of 10-40 nm (abstract, entirely within the instantly claimed range of 100 nm or less), wherein the conductive metal is silver (5:4); (ii) A dispersant associated with the metal or metal alloy particles (8:64-66) in sufficient quantity to reduce agglomeration of said particles (expected, since the dispersant is added to disperse particles); and heating said paste or colloid to a temperature and for a time sufficient to remove said binder and said dispersant, and to sinter metal particles of said metal or metal alloy powder together to

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form a conductive metal or metal alloy layer from said metal or metal alloy particles (10:8-12) which performs at least one of mechanically, thermally, or electrically interconnecting the device and the substrate (abstract, teaching both bonding and thermal/electrical conduction).

Kydd does not teach the instant invention using binder or being a paste prior to sintering, but does teach related art using binders, such as ethyl cellulose, in the composition (5:34, where ethyl cellulose has a volatilization temperature below the metal powder's sintering temperature). However, Kydd teaches US Patent Number 4,186,244 (hereinafter the '244 patent) is similar, wherein the silver particles are blended with a vehicle consisting of an ethyl cellulose binder and a pine oil solvent. As a result, it would have been obvious to use the vehicle of the '244 patent with the dispersant and silver particles of Kydd, since both references teach similar compounds and the vehicle of the '244 patent would make handling the silver particles of Kydd more manageable.

f. Regarding claim **17**, Kydd teaches the method of claim 14, further comprising a step of positioning via silk screening, stenciling or printing on at least one electrical contact of at least one of the device and the substrate said metal or metal alloy particles. (9:42-49).

g. Regarding claims **18**, Kydd teaches the method of claim 14, but does not expressly teach a "step of selecting said binder in said paste based on a desired temperature of volatilization." However, since Kydd teaches the complete decomposition of the composition, said limitation would be expected.

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- h. Regarding claim **19**, Kydd teaches the method of claim 14, further comprising a step of isolating said metal or metal alloy particles with said binder until a preset temperature during said heating step, wherein said preset temperature (see e.g. 10:34-41). Kydd does not expressly teach determining the preset temperature “based on said binder and a sintering temperature for said metal or metal alloy particles.” However, since Kydd teaches the preset temperature burns off isolates the silver from the MOD mixture and coating, said step of determining would be expected in the invention of Kydd.
- i. Regarding claim **20**, Kydd suggests the method of claim 19, wherein the preset temperature is 325°C, at which sintering of the silver particles occurs.

Response to Arguments

8. Applicant's arguments with respect to claims 1-12 and 14-20 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Zhang et al (Zhiye Zhang et al, Nanoscale Silver Sintering for High-Temperature Packaging of Semiconductor Devices, The Minerals, Metals & Materials Society (2004)).
10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to YOSHITOSHI TAKEUCHI whose telephone number is (571) 270-5828. The examiner can normally be reached on Monday-Thursday 9:30-3:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dr. Roy King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ Roy King/
Supervisory Patent Examiner, Art Unit
1793

/YOSHITOSHI TAKEUCHI/
Examiner, Art Unit 1793